



**REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN**

**FIELD OPERATIONS PLAN  
ROCKAWAY BOROUGH WELL FIELD SITE  
OPERABLE UNIT #3  
FOR PROPERTY OF  
KLOCKNER & KLOCKNER  
ROCKAWAY BOROUGH, NEW JERSEY**

**PART 3 - HEALTH AND SAFETY PLAN**

**SUBMITTED TO:**

**USEPA - REGION II  
EMERGENCY & REMEDIAL RESPONSE DIVISION  
NEW YORK, NEW YORK**

**SUBMITTED BY:**

**THE WHITMAN COMPANIES, INC.  
EAST BRUNSWICK, NEW JERSEY**


**ON BEHALF OF KLOCKNER & KLOCKNER**


**IN ACCORDANCE WITH:**

**ADMINISTRATIVE ORDER ON CONSENT  
INDEX NO. II-CERCLA-95-0104**

**JUNE 1997**

  
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**KLOCKNER & KLOCKNER  
SITE INVESTIGATION  
HEALTH AND SAFETY PLAN**

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1. Hazardous Chemicals Data Sheets
2. Heat Exhaustion/Stroke Information Sheets
3. Equipment Decontamination Procedures
4. **PID Calibration and Maintenance Log**

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## **HEALTH AND SAFETY DISCLAIMER**

This plan has been prepared by The Whitman Companies, Inc. for the sole use of its employees or subcontractors providing services directly under its supervision. The plan is designed to provide guidance for the implementation of Health and Safety procedures under OSHA 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response and US EPA 40 CFR 311 Worker Protection for environmental sampling, site remediation or related activities. Copies of this Health and Safety Plan (HASP) will be provided to Whitman Companies employees and contractors. A copy of this plan will also be located on site, at the command post.

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**HEALTH AND SAFETY PLAN  
KLOCKNER & KLOCKNER PROPERTY  
STICKLE AVENUE AND ELM STREET  
ROCKAWAY BOROUGH, NEW JERSEY**

**1.0 INTRODUCTION**

This Health and Safety Plan (HASP) has been prepared by The Whitman Companies, Inc. (Whitman) for the Klockner & Klockner property, located at the intersection of Stickle Avenue and Elm Street, Rockaway Borough, Morris County, New Jersey (Figure 1). The HASP was prepared for Whitman employees involved with the site investigation activities at the Klockner facility. Previous soil samples collected from the site indicate elevated levels of Trichloroethylene (TCE), Tetrachloroethylene (PCE), 1,2-Dichloroethylene and Petroleum Hydrocarbons (PHCs). Groundwater sampling results indicate elevated levels of TCE, PCE and metals. This plan is written to prescribe site control measures and personnel protection measures for field activities.

The proposed investigation activities will include a soil gas survey and subsequent soil sampling on the Building 12 and 13 properties (Figure 2). Procedures outlined in this plan will be followed by Whitman Companies' personnel, contractors and all other team members involved with the site investigation activities.

This revised HASP incorporates responses to EPA's March 20, 1997 comments concerning the May 1996 HASP submitted by The Whitman Companies, Inc. on behalf of Klockner. Changes made in the text are presented in **BOLD** type.

**2.0 ORGANIZATION AND CONTROL**

All Whitman Companies employees and contractors engaged in site investigation activities at the Klockner site are required to sign this Health and Safety Plan.

**2.1 Whitman Employees**

All Whitman Companies, Inc. employees who may potentially be exposed to safety and/or health hazards at this project site must comply with the provisions of this document. All employees covered by this document must print and sign the Health and Safety Plan

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(HASP) acknowledgement form, located on the last page of this document to verify that they fully understand the provisions of this plan.

## **2.2 Contractor Provisions**

The provisions of this HASP establish the requirements for site Health and Safety with regard to the conduct of contractors retained for this project. Contractors are expected to comply with the requirements of 29 CFR 1910.120. Contractors must then acknowledge understanding of the HASP by signing the Health and Safety Plan Acknowledgement Form.

All contractors to be used at the site will provide their own personal protective equipment as specified by the Whitman Companies, Inc. and by this HASP.

## **2.3 Visitors**

Visitors to the site will not be allowed to enter areas where a potential for exposure to hazardous substances exist unless they provide proof of having met the training requirements of 29 CFR 1910.120 and they agree to, and understand, the provisions of this document by signing the Health and Safety Plan Acknowledgement Form. Areas where potential hazards exist will be clearly marked and controlled to prevent access by unauthorized people.

## **2.4 Organizational Responsibilities**

The Whitman Companies **Project Coordinator** is responsible for overall management of the project and supervision of all site investigations. Whitman Companies, will designate an on site **Health and Safety Officer** who will be responsible for implementing this HASP and enforce compliance with health and safety requirements during hazardous site activities. The Safety Officer will have the authority to stop site activities if unsafe conditions exist or if health and safety requirements are not being followed by Whitman employees or contractors.

Additional Whitman employees may be assigned to the field project team as needed to provide specific technical consulting and services to assist with the site investigation. All personnel assigned to the project will be under the direction of the Project Coordinator or Field Team Leader.

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The names and designations of key site investigation members are listed below:

Project Coordinator	Michael Metlitz
Field Team Leader	Todd Gerber
Safety Officer	Michael Warner

The Whitman Companies will supervise all site operations. A single person may fill more than one of the roles specified above.

Support activities will be coordinated and located at the command post. The command post is located in the Whitman field vehicle. The nearest phone is located in the Whitman vehicle.

### **3.0 HAZARD EVALUATION**

This section identifies potential health hazards classified as chemical, physical, or general safety hazards. The hazard is identified, the potential effects of exposure or mishap are explained, and the preventive measures are described. These hazards are also summarized in Table 1. A summary table of the task-specific hazards, including historical information on the concentrations of the contaminants, is presented in Table 1A.

#### **3.1 Physical Hazards**

Potential physical hazards of this project are heat injury, fires/explosions, electrical hazards, material handling, kinetic-mechanical, slip/trip, fall, noise and cold injury. Table 1 is a summary of the physical hazards describing the potential hazard, cause or mode of injury, health effects and symptoms, hazard prevention and control.

**Heat Stress** (Attachment 2) or heat injury can occur from increased thermal burden due to environmental conditions and increased metabolic rate (work activity). Wearing protective equipment increases the thermal burden and reduces the body's ability to dissipate heat naturally. When the body is unable to effectively dissipate internal heat to maintain proper core body temperature through natural physiological functions such as sweating, heat stress disorders can occur. Factors such as ambient conditions (air temperature, humidity, cooling effect), workload, clothing and fluid consumption effect the body's ability to dissipate heat. When the body can no longer cope with the heat load, various heat related problems such as stroke, exhaustion, cramps and rash may occur.

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**Explosions and fires** may occur if an ignition source is introduced in or near a combustible substance or atmosphere. Explosions and fires can also occur due to chemical reactions under the right conditions. Environmental monitoring for combustible atmospheres and total organic vapors reduces the risks associated with potentially flammable or explosive atmospheres. **Available site data indicates explosion or fire hazards are associated with underground natural gas utility lines. Utility companies will be contacted to mark out underground lines prior to drilling.**

**Electrical hazards** due to improperly grounded electrical equipment or contact with underground lines during excavating, drilling and sampling below grade can cause electric shock and burns. Utility companies must be contacted to mark out underground lines prior to any digging or drilling. Safe distances to overhead power lines must be observed when operating drill rigs or machinery with extension arms such as backhoes. Employees must also observe any posted high voltage signs.

**Kinetic-mechanical** injuries such as broken bones can occur if a worker is struck by a piece of machinery or a projectile such as a ruptured compressed air cylinder. Injuries of this type can also occur from falling objects or dropped objects such as tools or stacked drums. Personal protection, hard hats, and steel-toed footwear help to minimize injuries from kinetic-mechanical hazards. General awareness and good work practice are the key to preventing these injuries.

**Slip/trip/fall** hazards can also cause broken bones and other physical injuries. Wet surfaces, unguarded trenches, manholes or test pits, poor housekeeping around the site, and lack of awareness can lead to accidents of this type. Proper work shoes with traction help to minimize slipping problems, while proper marking and guarding of open holes, etc., can prevent workers from falling into them. Equipment should be stored when it is no longer needed so that the project work area is left free of extraneous materials that could lead to someone tripping and getting hurt.

**Noise** levels greater than 90 decibels A-weighted (DBA) can cause permanent hearing impairment from unprotected exposure. Typical noise sources encountered during field activities are heavy equipment such as backhoes and drill rigs (mainly when resistance is encountered), as well as pumps and generators. Employees should wear hearing protection when working in hazardous noise environments. A general rule-of-thumb is if you cannot hear a person speaking in a normal tone at a distance of three (3) feet, you probably are in a environment with a noise level in excess of 90 decibels.

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**Cold injury** can occur when the body loses heat faster than it can produce it due to working in low ambient temperatures without proper thermal insulating clothing. During the winter season field project teams must protect against cold injury by wearing layers of thermal insulating clothing and covering exposed skin. Weather conditions should be monitored and a wind chill index applied to determine safe working conditions.

**Improper lifting**, pushing, pulling or carrying of heavy objects can cause lower back injury, hernias, and/or muscle pulls. The weight that a person can carry depend on their individual size and strength, but generally objects weighing more than 40 - 50 pounds are capable of causing injury. Personnel moving heavy equipment should use proper lifting techniques - lifting with the legs - to avoid injuries. The buddy system should be used to move heavier objects.

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TABLE 1

SUMMARY OF POTENTIAL PHYSICAL HAZARDS AND SAFETY HAZARDS

<u>Hazard Description</u>	<u>Source/Cause Mode of Injury</u>	<u>Potential Health Effects/Symptoms</u>	<u>Hazard Prevention/ Control Measures</u>
Heat Injury - Heat Stress - Heat Exhaustion - Heat Stroke (can be fatal)	Caused by combination of factors: - High ambient temperature - High humidity - Increased thermal burden due to PPE - Hard work activity - Low fluid intake - Air movement	<u>Heat Stress/Strain</u> - General discomfort due to heat, load on body, heavy sweating, lightheadedness, fatigue. <u>Heat Exhaustion</u> - Fatigue, weakness, profuse sweating, pale, clammy skin, headache, cramps, vomiting, fainting, confusion, weak pulse, heat rash. <u>Heat Stroke</u> - Dizziness, nausea, severe headache, hot dry skin, confusion, high temperature, feel chilled, incoherent speech, convulsions, collapse, delirium, coma and death.	- Have field team members drink plenty of fluids. - Establish work-rest regiments if conditions warrant. - Avoid diuretics such as coffee which increase fluid loss. - Monitor field team members closely for signs and symptoms of heat injury.
Noise - As a general rule of thumb, if a normal person -to-person communication is difficult at a distance of 2-3 feet, you are in a hazardous noise environment.	Working around or with equipment and/or machinery that generates noise levels above 90 decibels, A-weighted.	- Prolonged, unprotected exposure to noise levels above 90 DBA can cause permanent hearing equipment.	- Wear hearing protection in hazardous noise environments.

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TABLE 1 (Continued)

**SUMMARY OF POTENTIAL PHYSICAL HAZARDS AND SAFETY HAZARDS**

<u>Hazard Description</u>	<u>Source/Cause Mode of Injury</u>	<u>Potential Health Effects/Symptoms</u>	<u>Hazard Prevention/ Control Measures</u>
Cold Injury	Working outdoors in cold ambient temperatures without proper thermal insulation. Body loses heat faster than it can produce it.	<ul style="list-style-type: none"> <li>- The onset of hypothermia begins when the body's core temperature drops due to heat loss. This causes shivering, confusion, and disorientation. Moisture on skin worsens the conditions of heat loss from the skin.</li> </ul>	<ul style="list-style-type: none"> <li>- Wear adequate thermal insulating clothing, layered</li> <li>- Monitor ambient temperature and wind speed to determine wind chill index</li> <li>- Set up wind breaks around work locations to reduce the wind chill factor</li> </ul>
Fire/Explosions	Flammable atmospheres created due to release of organic vapors from contaminated sources, especially in confined or enclosed spaces.	<ul style="list-style-type: none"> <li>- In addition to physical destruction and burns, fires emit highly toxic byproducts such as smoke, fumes, etc. into the atmosphere.</li> </ul>	<ul style="list-style-type: none"> <li>- Monitor potentially combustible atmospheres frequently with combustible gas indicator (CGI), which measures percent of the lower explosive limit (% LEL).</li> <li>- Environments greater than 10% LEL are potentially combustibles and should not be entered. &lt;10% LEL should be monitored periodically if flammable materials are in use.</li> <li>- Avoid introducing ignition sources into potentially flammable atmospheres.</li> </ul>

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TABLE 1 (Continued)

**SUMMARY OF POTENTIAL PHYSICAL HAZARDS AND SAFETY HAZARDS**

<u>Hazard Description</u>	<u>Source/Cause Mode of Injury</u>	<u>Potential Health Effects/Symptoms</u>	<u>Hazard Prevention/ Control Measures</u>
Electrical Hazards	Contact with live electrical source conductors such as <del>underground or overhead</del> utility lines, electric generator stations, uninsulated or frayed power cords, or improperly wired/grounded equipment.	<ul style="list-style-type: none"> <li>- Electric shock and burns</li> <li>- If in an area where climbing is required, <del>even a mild shock can lead</del> to serious injury from a fall caused by the shock</li> <li>- Severity of shock depends on voltage (amount), the path of flow, and the time the current is allowed to flow through the body.</li> </ul>	<ul style="list-style-type: none"> <li>- Observe posted high voltage signs</li> <li>- Phone utilities for mark outs whenever <del>drilling or sampling below grade</del></li> <li>- Observe safe distances from overhead lines when working in their proximity with drill rigs, backhoes, etc.</li> <li>- Ensure power cords are three-prong type (grounded), and in good condition.</li> <li>- Use shielding and insulation between work and electric source, if necessary.</li> </ul>
Material Handling <ul style="list-style-type: none"> <li>- Lifting, pushing, pulling and/or carrying heavy objects</li> </ul>	Improper lifting of objects, generally weighing greater than 40-50 pounds (depends on size and strength of individual) such as generators, pumps, drilling equipment, etc.	<ul style="list-style-type: none"> <li>- Lower back injury, hernias, and/or muscle strains and pulls</li> <li>- Skin abrasion on hands</li> </ul>	<ul style="list-style-type: none"> <li>- Wear work gloves</li> <li>- Lift with legs with object close to body</li> <li>- Use buddy to lift heavier objects</li> <li>- Use mechanical equipment if object is too heavy to move</li> </ul>

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TABLE 1 (Continued)

**SUMMARY OF POTENTIAL PHYSICAL HAZARDS AND SAFETY HAZARDS**

<u>Hazard Description</u>	<u>Source/Cause Mode of Injury</u>	<u>Potential Health Effects/Symptoms</u>	<u>Hazard Prevention/ Control Measures</u>
Kinetic-Mechanical	Physical injury caused by being "struck by" heavy equipment and machinery, or dropped/falling heavy materials	- Broken bones, head injury, blunt trauma, and crushing injuries can occur from potential kinetic-mechanical hazards	- Hard hats and steel toed shoes - Prevention is related to safe work practices <del>- Machine operators must be aware of worker locations</del> - Use spotters when backing heavy equipment and vehicles - Be aware of surroundings and use care when handling materials that are stacked above such as drums
Slip/Trip/Fall	- Wet surfaces and slick surfaces, especially when ground water sampling - Uneven terrain, poor housekeeping - objects in disarray in pathways. - Open manholes, ditches, test pits - hazard is compounded when wearing PPE	- Broken bones, head injury, blunt trauma, skin abrasions	- Wear work shoes with non-slip soles and good traction - Store materials and equipment following uses; do not leave it lying around the work area - Guard open holes, trenches and pits with fences or barriers

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**TABLE 1A**  
**TASK SPECIFIC HAZARD SUMMARY**  
**ROCKAWAY BOROUGH WELL FIELD SITE - OPERABLE UNIT #3**  
**ROCKAWAY, NEW JERSEY**

Task	Chemical	Slip/Trip/ Fall	Kinetic/ Mechanical	Noise	Material Handling	Electrical	Heat Stress	Cold Injury	Explosion/ Fires	Contaminant Concentrations (ppm)
<b>BUILDING 12</b>										
Gasoline UST (SS)	LOW	MED	MED	MED	LOW	MED*	MED	MED	LOW	U
Waste Oil UST (SG,SS)	LOW	MED	MED	MED	LOW	MED*	MED	MED	LOW	PHC (<100), VOC (2)
Catch Basin/Storm Sewer (SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	PHC (3,000), VOC (0.28)
Leaching Pit (SS)	LOW	MED	MED	MED	LOW	MED*	MED	MED	LOW	VOC (34.9)
Degreaser Pit (SS)	LOW	MED	MED	MED	LOW	MED*	MED	MED	LOW	TCE (<1), PCE (<1)
Alleyway (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	TCE (2.4)
Scale Room (SG,SS)	MED	MED	HIGH	MED	HIGH	MED*	MED	LOW	LOW	TCE (16), DCE (0.012), T-1,2-DCE (1.1)
Quonset Hut (SG,SS)	LOW	MED	MED	MED	LOW	MED*	MED	MED	LOW	PCE (2.5), TCE (2.3)
Drum Storage Shed (SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Drum Storage in Alleyway (SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
North Drum Storage Area (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Sump (SS)	LOW	MED	LOW	LOW	MED	MED*	MED	MED	LOW	Unknown
Geologic Characterization	LOW	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
<b>BUILDING 13</b>										
Heating Oil USTs (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Dry Well (SG, SS)	LOW	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Site-wide Soil Gas Survey (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Former ASTs (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Oil Storage Shed (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Scrap Metal Storage Shed (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Storm Drain (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Pipe (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Cooling Water Discharge (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Floor Drains (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Dumpster Pad (SG,SS)	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown
Geologic Characterization	MED	MED	MED	MED	LOW	MED*	MED	MED	LOW	Unknown

**NOTES**

\* - Significant electrical hazards are those associated with underground and overhead utilities. If these the appropriate markouts can demonstrate that these hazards are not present in the soil sampling/drilling areas, then the electrical hazard would be classified as LOW.

LOW - Minimal risk is expected in this hazard category. No special precautions are necessary.

MED - Medium level of risk expected in this hazard category. General precautions are necessary.

HIGH - Significant level of risk expected in this hazard category. Special precautions are necessary.

AST - Aboveground storage tank

SG - Soil gas survey

SS - Soil sampling

UST - Underground storage tank

PCE - Tetrachloroethene

TCE - Trichloroethene

VOC - Volatile Organic Compounds

U - Undetected

T-1,2-DCE - 1,2-Dichloroethene (trans)

ppm - Parts per million

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### 3.2 Chemical Hazards

Potential exposure to vapors and dust containing PCE, TCE and 1,2-Dichloroethylene are the primary chemical hazards of concern.

PCE and TCE are carcinogens. TCE is also a mutagen. 1,2-Dichloroethylene is flammable and reactive. Important exposure information related to these chemicals is provided in Attachment 1. Table 2 provides the individual chemicals' OSHA permissible exposure limits (PELs) that will be utilized during the site investigation activities. Table 3 provides the action levels of personnel protection with respect to the specific chemical concentrations in the breathing zone.

**TABLE 2**  
Values in parts-per-million (ppm)

<u>Compound</u>	<u>TWA</u>	<u>STEL</u>	<u>IDLH</u>
TETRACHLOROETHYLENE	100	200	Carcinogen
TRICHLOROETHYLENE	100	200	Carcinogen
1,2-DICHLOROETHYLENE	200	NS	1000

#### Legend

TWA = Time weighted average for an 8 hour day

STEL = Short term 15 minute exposure

IDLH = Immediately dangerous to life and health

NS = No standard

### 4.0 PERSONAL PROTECTIVE EQUIPMENT

Standards/procedures for PPE use and limitations, maintenance and storage, decontamination, training and proper fitting, donning and doffing, inspection and program effectiveness evaluations are outlined in The Whitman Companies, Inc. written PPE program and will apply to all site activities.

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Selection of personal protective equipment (PPE) is dependent upon results of environmental air monitoring. The site work area will be monitored daily by the on site health & safety officer. Monitoring will be done using photoionization detector (PID) or comparable measuring device. The results of the atmospheric monitoring data are the basis for determining PPE.

Air monitoring will be performed at each new location of soil disturbance to determine the appropriate level of personal protection. Table 3 specifies action levels for each air monitoring parameter.

Air monitoring measurement will be taken directly above the work area, in the breathing zone and air monitoring readings will determine the proper level of protection with either Level D, C or B protection.

Level D protective equipment consists of:

1. Gloves, chemical resistant, as necessary
2. Boots, chemical resistant
3. Hard hat, as necessary

Level C protective equipment consists of:

1. Air-purifying respirator (full face to protect eye along with respiratory system)
2. HEPA and organic vapor cartridges
3. Coveralls (TYVEK), disposable
4. Gloves, taped to coveralls, chemical resistant
5. Boots, taped to coveralls, chemical resistant
6. Hard hat, as necessary

Level B protective equipment consists of:

1. Air-line full face pressure demand respiratory system (SCBA)
2. Escape system for SCBA
3. Coveralls (TYVEK), disposable
4. Inner and outer gloves, chemical resistant
5. Boots, taped to coveralls, chemical resistant
6. Hard hat, as necessary

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Level D protective equipment will be utilized as long as the organic vapor levels, as measured with a PID in the **breathing zone** do not exceed 50 ppm above background (Half of the 100 ppm standard for PCE and TCE).

Level C protection equipment will be only for decontamination of level B if utilized. Level B equipment will be used when the organic vapor levels in the **breathing zone** exceed 50 ppm.

The Whitman Companies Project Coordinator or Safety Officer has the responsibility of informing all personnel (Whitman Companies team members and contractors) of the level of personal protective equipment required at the site. The Project Coordinator and Safety Officer have the responsibility of changing the level of protective equipment as conditions warrant.

**TABLE 3**

**ACTION LEVELS FOR SELECTION OF PERSONAL  
PROTECTIVE EQUIPMENT**

All Values Measured in The Breathing Zone

<u>Instrument</u>	<u>Measured Level</u>	<u>Action Levels</u>
Photovac (PID)	< 50 ppm	Level D
	> 50 ppm	Level B

**5.0 SAFETY EQUIPMENT**

Safety equipment necessary for monitoring and emergency response will be kept at the Rockaway Borough site during investigation activities. In addition to personal protective equipment, safety equipment will include the following:

1. ABC type fire extinguisher (20 lbs)
2. First aid kit
3. Photoionization Detector (PID)

These items will be kept in the Whitman Vehicle. The Level B equipment will be available on an as needed basis.

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No site investigation activities will be conducted in any areas currently associated with the storage of any flammable materials or significant quantities of combustible gases. A utility markout will be ordered to identify the locations of subsurface natural gas supply lines. In addition to this, no site investigation activities will be conducted in confined space areas. Since the fire/explosion potential threat from the contaminants is low and there is no work in confined space areas, monitoring for combustible gases is not required. If future site conditions present a potential combustible atmosphere threat, then a combustible gas indicator (CGI) will be used to monitor the atmosphere. The CGI would be operated and maintained in accordance with the manufacture's instructions.

The PID will be operated, calibrated and maintained in accordance with the manufacturer's instructions. Calibration will be performed daily and prior to the day's remediation/investigation activities. Calibration will also be performed between usages in separate areas of environmental concern. The UV light source window and ionization chamber will be cleaned at least once a month. Calibration and maintenance activities will be documented on the PID Calibration and Maintenance Log (Attachment 4).

## **6.0 DECONTAMINATION PROCEDURES**

The following decontamination procedure will be followed when exiting Level D, C or B areas.

1. Remove loose soil from equipment and/or clothing.
2. Wash equipment with detergent and water.
3. Discard disposable equipment and clothing in a designated container.
4. Bag and dispose of wastes having no additional restrictions.

Equipment decontamination procedures are included in Attachment 3.

Work zones for Building 12 and Building 13 areas are presented in Figures 4 and 5, respectively. The locations of the Exclusion, Contamination-Reduction and Support Zones related to soil sampling activities are indicated in the figures. Support Zones are assumed to be located outside of the Contamination-Reduction Zones.

Some soil sampling locations will be chosen based on the results of soil gas survey and field screening information. In these cases, 10' diameter Exclusion Zones will be centered around each soil boring. A Contamination-Reduction Zone will extend out 5' from the outer boundary of the Exclusion Zone.

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Decontamination procedures shall be monitored by the site safety and health supervisor to determine their effectiveness. When such procedures are found to be ineffective, appropriate steps shall be taken to correct any deficiencies.

## **7.0 TRAINING PROGRAM**

All Whitman Companies or contractors employees involved in the execution of the remedial activities have received an OSHA 40 hour training course as well as the annual update as required. The Project Coordinator has also completed a supervisor of Hazardous Waste Operations 8 hour training course.

Individuals functioning independently of an immediate supervisor shall have a minimum of three days of actual field experience under a skilled supervisor.

Whitman Companies employees assigned to this site will receive a copy of the site Health and Safety Plan including a copy of relevant drawings and related material and be briefed in its contents prior to site entry.

If the Plan is revised, all affected personnel will be briefed and/or receive a new copy of the Plan. The Plan will be reviewed after every emergency or serious injury.

## **8.0 PERSONAL HYGIENE**

The Whitman Companies or Contractors personnel have the following personal hygiene requirements.

1. No eating, drinking, smoking, gum or tobacco chewing is allowed in the work zone.
2. Wash hands and face before leaving work area.
3. Contact with contaminated surface or surfaces suspected of being contaminated will be avoided while unprotected.
4. Any person under a physician's care and/or taking medication must inform the Safety Officer.
5. Personnel using respirators must be fit tested, clean shaven and trained in respiratory protection.

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## **9.0 MEDICAL SURVEILLANCE PROGRAM**

Contractors and Whitman Companies personnel who are or may be exposed to hazardous materials will be required to be enrolled in a medical surveillance program.

A summary of the medical surveillance program in which Whitman employees are enrolled is detailed below:

1. Basic physical examination including: Health history survey; Blood pressure; Height; Weight; Distance vision; Color vision; Pulse; Doctor's physical examination
2. SMA 25
3. CBC w/diff
4. Urinalysis
5. Methemoglobin Blood Test
6. Electrocardiogram
7. Spirometry (Pulmonary Function Test)
8. Chest X-ray
- \* 9. PCB Blood Test
- \*10. Urine Test for: Mercury, Lead, Arsenic

\* Only Field Investigators and Field Workers

## **10.0 PERSONNEL/ENVIRONMENTAL MONITORING**

Specific personnel monitoring is not required during site remedial activities.

## **11.0 COMMUNICATION/PHONE NUMBERS**

A communication network will be established to coordinate on site and off site activities including emergency response (Section 12). The field project team will be working at various locations of the site and direct verbal communication will be the primary means of communicating.

A telephone will be used for off site communications and emergency notifications.

The communication net work is listed below.

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	<u>Phone Number</u>
Chemtrec	800-424-9300
Police	911
Fire	911
Hospital	911 or 201-625-6063
NJDEP	609-292-7172
Project Coordinator Home	908-219-1620
The Whitman Companies, Inc.	908-390-5858
Daniel Klockner (Owner Representative)	201-334-6654
USEPA (Spill Response information only)	800-424-8802

## **12.0 EMERGENCY/PROBLEMS CHAIN-OF-COMMAND**

### **12.1 Chain of Command**

If a release, emergency or other unexpected situation arises on site, The Whitman Companies should be notified immediately. If The Whitman Companies, Inc. is not on site when the event occurs, please use the following contact list:

<u>Name</u>	<u>Office # and Address</u>	<u>Home #</u>
Dr. Ira Whitman, Principal	The Whitman Companies, Inc. 44 West Ferris Street East Brunswick, NJ 08816 908-390-5858	908-254-3235
Michael Metlitz, Project Coordinator	The Whitman Companies, Inc. 44 West Ferris Street East Brunswick, NJ 08816 908-390-5858	908-219-1620

### **12.2 Active Work Zone Emergencies**

Fire/Explosion: A severe emergency such as a fire or explosion could require immediate evacuation of the site. The emergency response notification process should take place as soon as an incident occurs.

300743



In the event of an evacuation of the Active Work Area, affected personnel will leave immediately, go through decontamination if time permits and reassemble at the closest street. The signal for an evacuation is three (3) long bursts of a air or vehicle horn.

### **12.3 Emergency Spill Containment/Control Plan**

Spill/Release: Upon a detected spill or release of a hazardous substance or waste, there must be notification to the state (NJDEP), Local Authorities, Klockner & Klockner, and The Whitman Companies. Spills/Releases should be contained where possible by diking or otherwise isolating the spill/release. If necessary, an emergency response contractor will be contacted to provide assistance. If product is encountered during soil investigation activities, there must be notification to The Whitman Companies.

In the event of a spill or leak of a liquid chemical or hazardous waste, personnel in the area of the spill will do the following:

- Inform the Safety Officer immediately
- Determine if adequate protective equipment is available to enter area of the spill i.e. IDLH conditions
- Get spill kit materials
- Identify source of spill
- Contain, absorb and recover spilled substance in proper containers
- Dispose of spilled materials properly, according to local, state and federal regulations

### **12.4 Spill Prevention**

The prevention of spills through good work practice is the most important aspect of the spill containment/control plan. The following standard work practices for material handling will minimize the potential for spills.

- All drums and containers used during the cleanup shall meet the appropriate DOT, OSHA and EPA regulations for the wastes that they will contain.

300744



- Drums and containers shall be inspected and their integrity assured prior to moving them. Drums or containers that cannot be inspected before being moved because of storage conditions shall be positioned in an accessible location and inspected prior to further handling.
- Operations on site will be organized so as to minimize the amount of drum or container movement.
- Where spills, leaks, or ruptures may occur, adequate quantities of spill containment equipment will be stationed in the immediate area. The spill containment program must be sufficient to contain and isolate the entire volume of hazardous substances being transferred.
- Drums or containers that cannot be moved without rupture, leakage, or spills, shall be emptied into a sound container.
- Fire extinguishing equipment meeting 29 CFR 1910 Subpart L shall be on hand ready for use to control fires.

### **13.0 MEDICAL EMERGENCY RESPONSE**

In the event of a medical emergency, the nearest hospital is Saint Clare's-Riverside Medical Center, 25 Pocono Road, Denville, New Jersey (201) 625-6063. If the injury is minor, the victim will be transported to the hospital by automobile. Directions from the site to Hospital are as follows:

Exit site. Make a right onto Elm Street heading north. Make a right onto Ford Avenue (Ford is the first street past Stickle Avenue). Follow Ford onto Route 80 Eastbound. Exit onto Route 46 West (first exit off of Route 80). Make a left onto West Main Street. Make a left onto Diamond Spring Road. Make a right onto Pocono Road. The hospital is at 25 Pocono Road.

The average transit time to the Hospital is 10 minutes. See Figure 3 for hospital location. If the nature of the injury requires transportation assistance, the local ambulance squad will be contacted by calling 911. The ambulance response time is about 5 minutes.

The nearest emergency first aid kit is at the command post.

300745



#### **14.0 TRENCHING/EXCAVATION**

No confined space, trenching or excavating activities will be conducted as part of the site investigation.

#### **15.0 PLAN REVISIONS**

The site Health and Safety Plan will be revised whenever the following events occur:

1. The Plan fails in an emergency
2. New physical or chemical hazards are discovered
3. Changes occur in phone numbers, personnel, etc.

All personnel will be briefed when pertinent changes occur.

300746





**SITE NAME:** Klockner

*"I have received a copy, read, understood and agreed to comply with the provisions of the above referenced site Health and Safety Plan for work activities on this site."*

Signature

Date[illegible]

Date

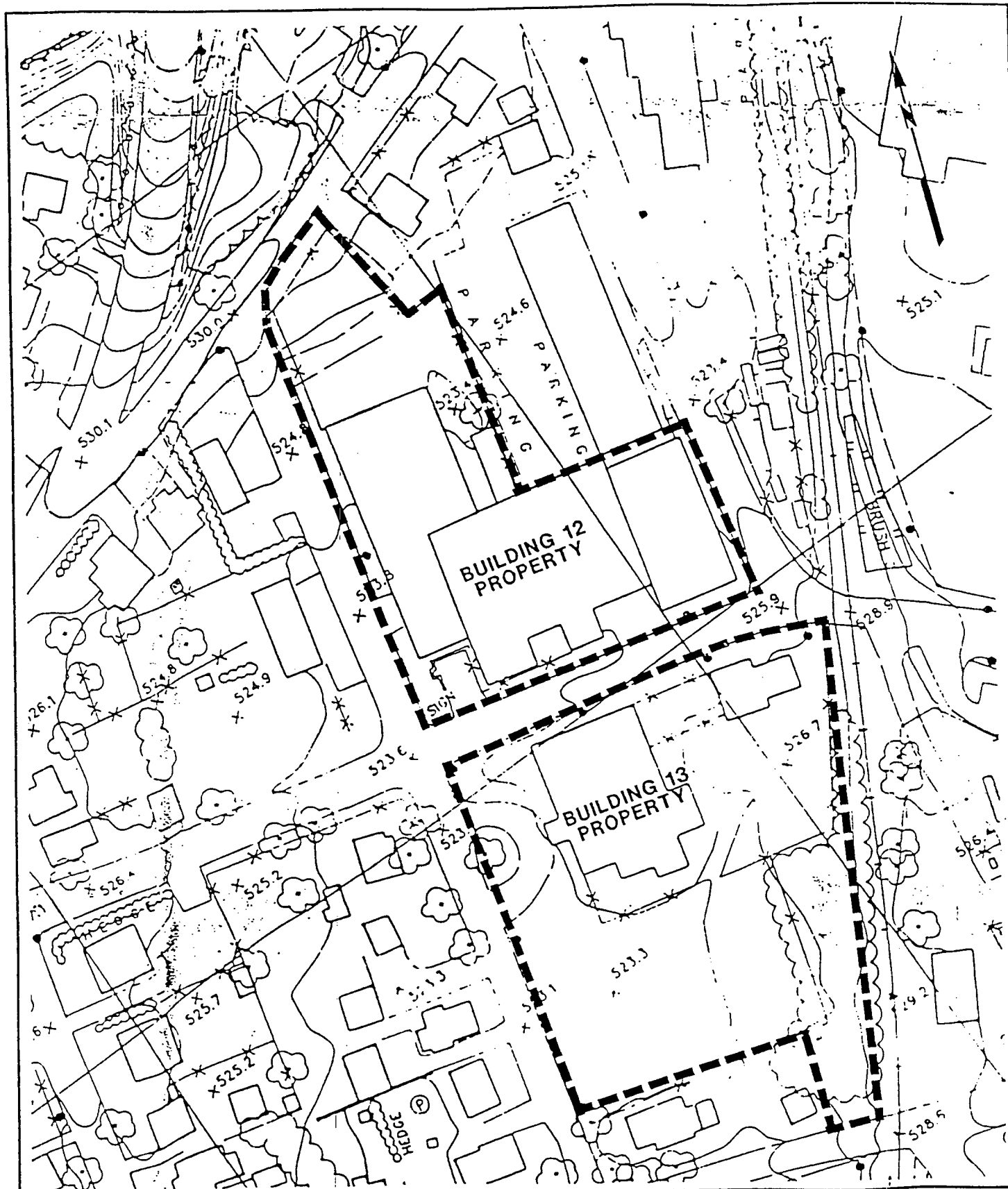
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population (millions)	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5
GDP (trillion USD)	45.0	48.0	51.0	54.0	57.0	60.0	63.0	66.0	69.0	72.0	75.0	78.0	81.0	84.0	87.0	90.0	93.0	96.0	99.0	102.0	105.0
Urban population (millions)	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5
Rural population (millions)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Life expectancy (years)	72.5	73.5	74.5	75.5	76.5	77.5	78.5	79.5	80.5	81.5	82.5	83.5	84.5	85.5	86.5	87.5	88.5	89.5	90.5	91.5	92.5
Renewable energy share (%)	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	35.0
Renewable energy capacity (GW)	100.0	110.0	120.0	130.0	140.0	150.0	160.0	170.0	180.0	190.0	200.0	210.0	220.0	230.0	240.0	250.0	260.0	270.0	280.0	290.0	300.0
Renewable energy investment (billion USD)	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0	100.0	105.0	110.0	115.0	120.0	125.0	130.0	135.0	140.0	145.0	150.0
Renewable energy jobs (million)	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
Renewable energy R&D (billion USD)	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0
Renewable energy policy index	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0

## FIGURES

300749







SOURCE:

300751

AERIAL SURVEY DATED JUNE 1994 PREPARED  
BY ROBINSON AERIAL SURVEY'S INC. FOR  
CONESTOGA-ROVERS & ASSOCIATES



THE  
WHITMAN  
Companies,  
INC.

KLOCKNER & KLOCKNER PROPERTY  
ROCKAWAY BOROUGH  
MORRIS COUNTY, NJ

SITE MAP OF  
KLOCKNER PROPERTY

ORIG. BY: MM

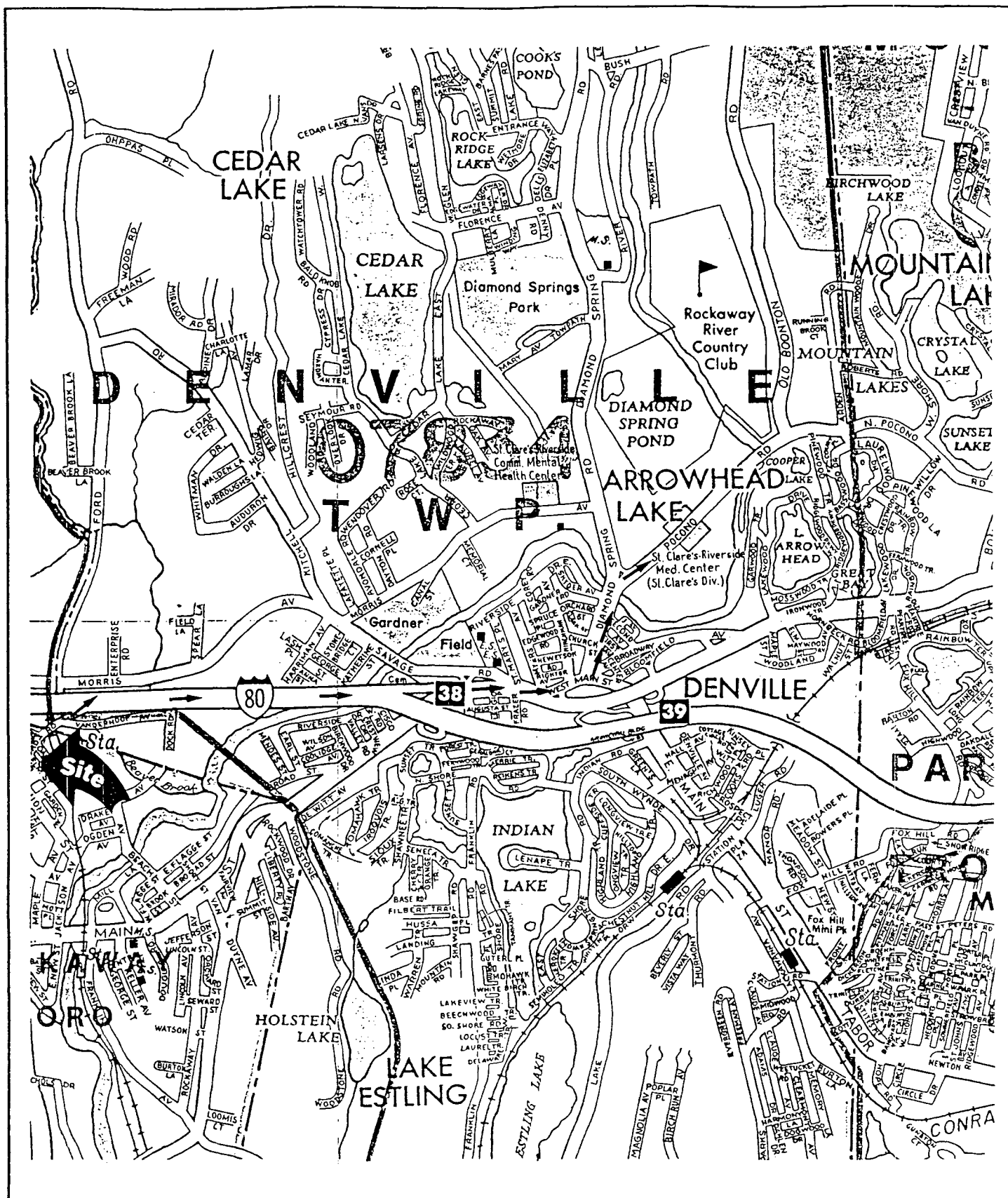
DWG. BY: *A. Villar*

CHK. BY: MM

DWG.#:

DATE: MAY 1996

FIGURE: 2



300752



THE  
WHITMAN  
Companies,  
INC.

KLOCKNER & KLOCKNER PROPERTY  
ROCKAWAY BOROUGH  
MORRIS COUNTY, NJ

LOCATION OF HOSPITAL

ORIG. BY: MM

DWG. BY: *A. Vittar*

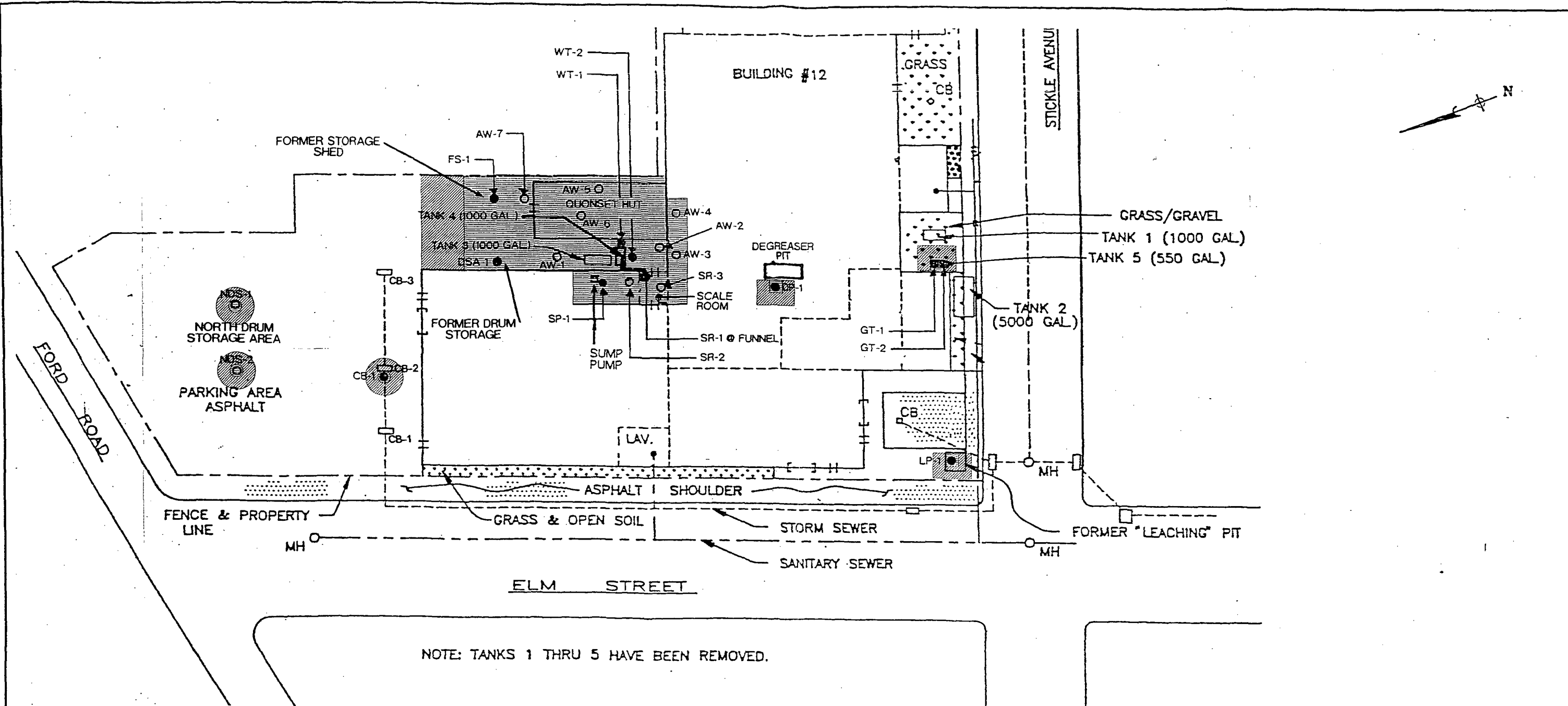
CHK. BY: MM

DWG. #:

DATE: MAY 1996

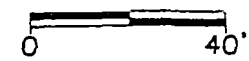
FIGURE: 3

SOURCE: HAGSTROM MORRIS COUNTY MAP



300753

SCALE



**LEGEND**

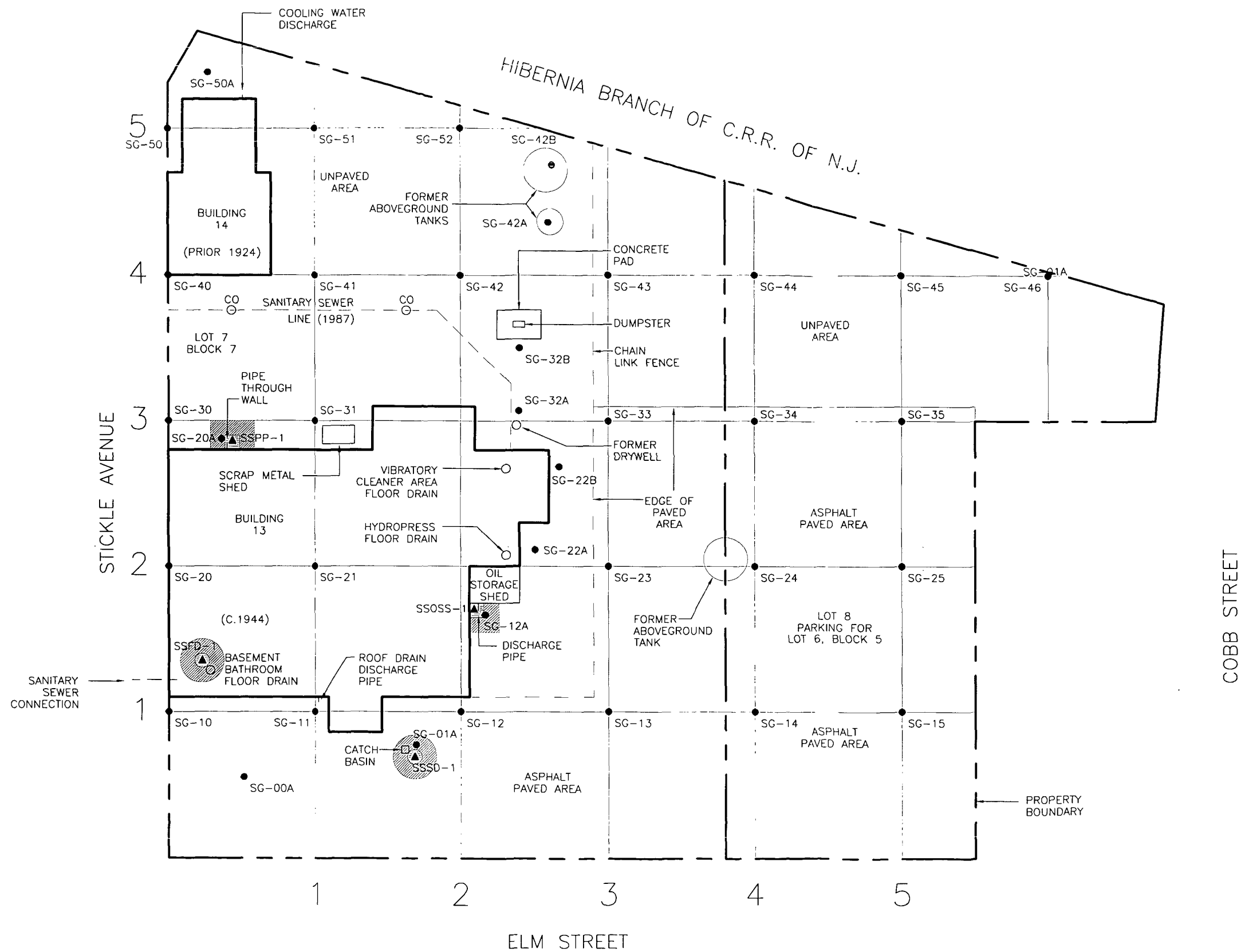
- CB - CATCH BASIN
- SP-1 - SAMPLE DESIGNATION (TYPICAL)
- - PROPOSED SOIL SAMPLE LOCATION
- - POTENTIAL SOIL SAMPLE LOCATION (ACTUAL LOCATIONS WILL BE BASED ON RESULTS OF SOIL GAS SURVEY)
- ALL SAMPLE LOCATIONS ARE SOIL SAMPLES.

- 0' HATCHING INDICATES EXCLUSION ZONE
- 45° HATCHING INDICATES CONTAMINATION-REDUCTION ZONE

NOTE: SUPPORT ZONE INCLUDES ALL AREAS OUTSIDE THE EXCLUSION AND CONTAMINATION-REDUCTION ZONES

			KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NJ		
			WORK ZONE LOCATIONS BUILDING 12		
ORIG. BY: MM		DWG. BY: A. Viller		CHK. BY: MM	
DWG. #:		DATE: MAY, 1996		FIGURE: 4	

REVISED MAY 1997



# LEGEND

- SG-01 - PROPOSED SOIL GAS SURVEY SAMPLE LOCATION
- ▲ SSSD-1 - PROPOSED SOIL SAMPLE LOCATION
- GRID ROW LOCATION
- SG-32B ← LOCATION OFF GRID
- GRID COLUMN LOCATION
- 0' HATCHING INDICATES EXCLUSION ZONE
- 45' HATCHING INDICATES CONTAMINATION-REDUCTION ZONE

NOTE:  
SUPPORT ZONE INCLUDES ALL AREAS OUTSIDE THE EXCLUSION AND CONTAMINATION-REDUCTION ZONES

300754

SCALE



	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NJ	
	WORK ZONE LOCATIONS BUILDING 13	
ORIG. BY: MM	DWG. BY: S. Smith	CHK. BY: MM
DWG.#: 950302Z	DATE: MAY, 1996	FIGURE: 5

REVISED MAY 1997



**ATTACHMENT 1**

**HAZARDOUS CHEMICALS DATA SHEETS**

300755





New Jersey Department of Health

# HAZARDOUS SUBSTANCE FACT SHEET

Common Name: TETRACHLOROETHYLENE

CAS Number: 127-18-4

DOT Number: UN 1897

RTK Substance number: 1810

Date: 3/6/87 Revision: First

## HAZARD SUMMARY

- \* Tetrachloroethylene can affect you when breathed in and by passing through your skin.
- \* Tetrachloroethylene should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- \* It may damage the developing fetus.
- \* High exposure can cause you to become dizzy and lightheaded and to pass out.
- \* It can cause the heart to beat irregularly or stop. This can cause death.
- \* Severe liver and kidney damage can occur.
- \* High exposure may cause a build-up of fluid in the lungs (pulmonary edema).
- \* Contact can cause eye and skin burns.

## IDENTIFICATION

Tetrachloroethylene is a clear liquid with a sweet chloroform-like odor. It is used in dry cleaning and metal degreasing.

## REASON FOR CITATION

- \* Tetrachloroethylene is on the Hazardous Substance List because it is regulated by OSHA and cited by NIOSH, CAG, ACGIH, DOT and NFPA.
- \* This chemical is also on the Special Health Hazard Substance List because it is a CARCINOGEN.
- \* Definitions are provided on page 5.

## HOW TO DETERMINE IF YOU ARE BEING EXPOSED

- \* Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer. If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- \* ODOR THRESHOLD = 27 ppm.
- \* The odor threshold only serves as a warning of exposure. Not smelling it

does not mean you are not being exposed.

## WORKPLACE EXPOSURE LIMITS

- \* These exposure limits are for air levels only.

OSHA: The legal permissible exposure limits (PEL) are 100 ppm averaged over an 8-hour workshift and an employee may be exposed to a concentration of Tetrachloroethylene above 200 ppm (but never above 300 ppm) only for a maximum period of 5 minutes in any 3 hours.

ACGIH: The recommended airborne exposure limit is 50 ppm averaged over an 8-hour workshift and 200 ppm as a STEL (short term exposure limit).

NIOSH: The recommended airborne exposure is the lowest feasible limit.

- \* Tetrachloroethylene may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

## WAYS OF REDUCING EXPOSURE

- \* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- \* Wear protective work clothing.
- \* Wash thoroughly immediately after exposure to Tetrachloroethylene and at the end of the workshift.
- \* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of Tetrachloroethylene to potentially exposed workers.

300756

This Fact Sheet is a summary source of information for workers, employers, and community residents. Health professionals may also find it useful. If this substance is part of a mixture, this Fact Sheet should be used along with the manufacturer-supplied Material Safety Data Sheet (MSDS).

## HEALTH HAZARD INFORMATION

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to Tetrachloroethylene:

- \* High exposure can cause you to become dizzy, lightheaded, and to pass out.
- \* Overexposure can cause the heart to beat irregularly or stop. It can also damage the liver and kidneys enough to cause death.
- \* Breathing the vapor may irritate the lungs, causing coughing and/or shortness of breath. Higher exposure can cause a build-up of fluid in the lungs (pulmonary edema). This can cause death. These effects can be delayed for many hours.
- \* Contact with the liquid can cause severe skin burns, and can cause eye burns.
- \* Exposure to the vapor can irritate the eyes, nose, mouth and throat.

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Tetrachloroethylene and can last for months or years:

### Cancer Hazard

- \* Tetrachloroethylene may be a CARCINOGEN in humans since it causes liver cancer in animals.
- \* Many scientists believe there is no safe level of exposure to a carcinogen.

### Reproductive Hazard

- \* Tetrachloroethylene may damage the developing fetus.

### Other Long-Term Effects

- \* Tetrachloroethylene may damage the liver and kidneys with high single exposures or lower repeated exposures.

- \* Long-term exposure can cause drying and cracking of the skin.
- \* Very irritating substances may affect the lungs. It is not known whether Tetrachloroethylene causes lung damage.

## MEDICAL

### Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact) the following are recommended before beginning work and at regular times after that:

- \* Urinalysis.
- \* Liver function tests.
- \* Lung function tests.

If symptoms develop or overexposure is suspected, the following may be useful:

- \* Consider chest x-ray after acute overexposure.
- \* Special 24 hour EKG (Holter monitor) to look for irregular heart beat.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

### Mixed Exposures

- \* Because more than light alcohol consumption can cause liver damage, it can increase the liver damage caused by Tetrachloroethylene.
- \* Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

## WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best pro-

tection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- \* Where possible, automatically pump liquid Tetrachloroethylene from drums or other storage containers to process containers.
- \* Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document on Tetrachloroethylene #76-185.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

- \* Workers whose clothing has been contaminated by Tetrachloroethylene should change into clean clothing promptly.
- \* Do not take contaminated work clothes home. Family members could be exposed.
- \* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to Tetrachloroethylene.
- \* Eye wash fountains should be provided in the immediate work area for emergency use.
- \* If there is the possibility of skin exposure, emergency shower facilities should be provided.
- \* On skin contact with Tetrachloroethylene, immediately wash or shower to remove the chemical.
- \* At the end of the workshift, wash areas of the body that may have had contact with this chemical, whether or not known contact has occurred.

- \* Do not eat, smoke, or drink where Tetrachloroethylene is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

#### PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

#### Clothing

- \* Avoid skin contact with Tetrachloroethylene. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- \* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
- \* ACGIH recommends Nitrile Rubber, Polyvinyl Alcohol, or Viton as good to excellent protective materials.

#### Eye Protection

- \* Eye protection is included in the recommended respiratory protection.

#### Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- \* Engineering controls must be effective to ensure that exposure to Tetrachloroethylene does not occur.
- \* At any exposure level, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow

mode, or use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

## HANDLING AND STORAGE

Prior to working with Tetrachloroethylene you should be trained on its proper handling and storage.

Tetrachloroethylene must be stored to avoid contact with STRONG OXIDIZERS, such as CHLORINE, BROMINE, and CHLORINE DIOXIDE; CHEMICALLY ACTIVE METALS, such as BARIUM, LITHIUM, and BERYLLIUM; and NITRIC ACID, since violent reactions occur.

Store in tightly closed containers in a cool, well-ventilated area away from HEAT.

## QUESTIONS AND ANSWERS

If I have acute health effects, will I later get chronic health effects?

Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Can I get long-term effects without ever having short-term effects?

Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

What are my chances of getting sick when I have been exposed to chemicals?

The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

When are higher exposures more likely? Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone do not cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Aren't pregnant women at the greatest risk from reproductive hazards?

A: Not necessarily. Pregnant women are at greatest risk from chemicals which harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of child-bearing age are at high risk.

The New Jersey State Department of Health, Occupational Disease Prevention and Information Program offers multiple services in occupational health. These include: Right to Know Information Resources, Public Presentations, General References, Industrial Hygiene Information, Surveys and Investigations, and Medical Evaluation. Consult another Fact Sheet for a more detailed description of these services or call (609) 984-1863.

## DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

CAG is the Carcinogens Assessment Group of the federal EPA.

A carcinogen is a substance that causes cancer.

The CAS number is assigned by the Chemical Abstracts Service to identify a specific chemical.

A combustible substance is a solid, liquid or gas that will burn.

A corrosive substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A fetus is an unborn human or animal.

A flammable substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The flash point is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A miscible substance is a liquid or gas that will evenly dissolve in another.

mg/m<sup>3</sup> means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A mutagen is a substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A reactive substance is a solid, liquid or gas that can cause an explosion under certain conditions or on contact with other specific substances.

A teratogen is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The vapor pressure is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

I N F O R M A T I O N <<<<<<<<<<<<<<.

## HANDLING AND STORAGE (See page 4)

NJ POISON INFORMATION 1-800-962-1253

Hazard Rating Key: 0=minimal; 1=slight;  
2=moderate; 3=serious; 4=severe

## Eye Contact

- \* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention.

\* Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention.

- \* Remove the person from exposure.
- \* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- \* Transfer promptly to a medical facility.
- \* Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed.

## PHYSICAL DATA

Vapor Pressure: 14 mm Hg at 68°F  
Water Solubility: Insoluble

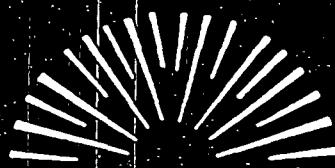
- OTHER COMMONLY USED NAMES

Not intended to be copied and sold for commercial purposes.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

DEP HOTLINE: (609) 292-7172  
CHEMTREC: (800) 424-9300

300761



New Jersey Department of Health

# HAZARDOUS SUBSTANCE FACT SHEET

**COMMON NAME:**

TRICHLOROETHYLENE

**CAS NUMBER:**

79-01-6

**DOT NUMBER:**

UN 1710

**HAZARD SUMMARY**

- \* Trichloroethylene can affect you when breathed in.
- \* It should be handled as a CARCINOGEN -- WITH EXTREME CAUTION.
- \* Exposure can cause you to feel dizzy and to pass out.
- \* Exposure can cause an irregular heart-beat leading to sudden death.
- \* High levels may cause brain damage and death. Repeated exposure can cause fatigue, memory loss, headache, irritability, mental confusion, and depression.
- \* It can damage the liver and kidneys. High exposures can irritate the lungs.
- \* Prolonged contact can burn the skin.

**IDENTIFICATION**

Trichloroethylene is a colorless liquid with a sweet odor. It is used as a solvent for degreasing and dry cleaning, and in printing inks, paints, lacquers, varnishes, and adhesives.

**REASON FOR CITATION**

- Trichloroethylene is on the Workplace Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, CAG and NIOSH.
- \* This chemical is on the Special Health Hazard Substance List because it is a CANCER-CAUSING AGENT and a MUTAGEN.
  - \* Definitions are provided on page 5.

**WORKPLACE EXPOSURE LIMITS**

OSHA: The legal airborne permissible exposure limit (PEL) is 100 ppm averaged over an 8-hour workshift, 200 ppm as a ceiling limit, and 300 ppm as an acceptable maximum peak above the ceiling limit for 5 minutes duration in a 2 hour period.

NIOSH: The recommended airborne exposure limit is 25 ppm averaged over a 10-hour workshift.

- \* Trichloroethylene may be a CANCER-CAUSING AGENT in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

**HOW TO DETERMINE IF YOU ARE  
BEING EXPOSED**

- \* Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer. If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- \* ODOR THRESHOLD = 28 ppm.
- \* The odor threshold only serves as a warning of exposure. Not smelling it does not mean you are not being exposed.

**WAYS OF REDUCING EXPOSURE**

- \* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- \* Wear protective work clothing.
- \* Wash thoroughly immediately after exposure to Trichloroethylene and at the end of the workshift.
- \* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of Trichloroethylene to potentially exposed workers.

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This Fact Sheet is a summary source of information for workers, employers, and community residents. Health professionals may also find it useful. If this substance is part of a mixture, this Fact Sheet should be used along with the manufacturer-supplied Material Safety Data Sheet (MSDS).

## HEALTH HAZARD INFORMATION

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to Trichloroethylene:

- \* Trichloroethylene may irritate the skin, causing a rash or a burning feeling. Prolonged contact can burn and blister the skin.
- \* The liquid may damage and irritate the eyes.
- \* Exposure to the vapor can irritate the eyes, nose, throat, and lungs. Higher levels can cause a build-up of fluid (pulmonary edema). This can cause death.
- \* Exposure can cause lightheadedness, dizziness, visual disturbances, an excited feeling, nausea and vomiting. Very high levels can cause irregular heartbeat, unconsciousness, and death.

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Trichloroethylene and can last for months or years:

### Cancer Hazard

- \* Trichloroethylene may be a CANCER-CAUSING AGENT in humans since it has been shown to cause liver cancer in animals.
- \* Many scientists believe there is no safe level of exposure to a cancer-causing agent.

### Reproductive Hazard

- \* There appears to be an association between exposure to various solvents (including Trichloroethylene and Toluene) and birth defects among women in the shoe-making industry. Trichloroethylene's role in this association is unclear.
- \* There is limited evidence that Trichloroethylene is a teratogen in ani-

mals. Until further testing has been done, it should be treated as a possible teratogen in humans.

### Other Long-Term Effects

- \* Trichloroethylene may cause a skin allergy. If an allergy develops, very low future exposures can cause itching and a skin rash.
- \* It can damage the liver and kidneys.
- \* Repeated exposure can cause memory loss, headache, intolerance of alcohol, depression, and weakness in the arms and legs.
- \* Prolonged or repeated contact can cause irritation, blistering, roughening, and cracking of the exposed skin. Repeated immersion of the hands in Trichloroethylene may cause paralysis of the fingers.
- \* Exposure can damage the facial nerves even causing paralysis.

## MEDICAL

### Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

- \* Liver function tests.

If symptoms develop or overexposure is suspected, the following may be useful:

- \* Exam of the nervous system. Consider nerve conduction tests.
- \* Urinary Trichloroacetic Acid level (for repeated exposures) or blood Trichloroethylene levels (for acute exposure).
- \* Consider chest x-ray after acute overexposure.
- \* Evaluation by a qualified allergist, including careful exposure history and special testing, may help diagnose skin allergy.
- \* Kidney function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure. Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

### Mixed Exposures

Drinking alcohol (beer, wine, liquor) may cause a flush on the back and neck in people exposed to Trichloroethylene.

Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by Trichloroethylene.

### WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace, and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- \* Where possible, automatically pump liquid Trichloroethylene from drums or other storage containers to process containers.
- \* Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document: Occupational Exposure to Trichloroethylene # 73-11025.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

- \* Workers whose clothing has been contaminated by Trichloroethylene should change into clean clothing promptly.
- \* Do not take contaminated work clothes home. Family members could be exposed.
- \* Contaminated work clothes should be laundered by individuals who have been

informed of the hazards of exposure to Trichloroethylene.

- \* Eye wash fountains should be provided in the immediate work area for emergency use.
- \* Do not eat, smoke, or drink where Trichloroethylene is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
- \* Do not smoke in the work area. Even a little vapor inhaled through a burning cigarette, cigar, or pipe will be converted into more highly toxic substances.

### PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

#### Clothing

- \* Avoid skin contact with Trichloroethylene. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- \* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
- \* ACGIH recommends VITON for providing excellent protection.

#### Eye Protection

- \* Wear splash-proof chemical goggles and face shield when working with the liquid and airtight goggles and face shield when exposed to the vapor.

#### Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator

fit testing, and medical exams, as described in OSHA 1910.134.

- \* Where the potential exists for exposures over 25 ppm, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode, or use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
- \* Exposure to 1,000 ppm is immediately dangerous to life and health. If the possibility of exposures above 1,000 ppm exists use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

#### HANDLING AND STORAGE

- \* Prior to working with Trichloroethylene you should be trained on its proper handling and storage.
- \* Trichloroethylene must be handled and stored away from operations which generate HIGH TEMPERATURES, such as ARC WELDING or CUTTING; UNSHIELDED RESISTANCE HEATING; OPEN FLAMES; and HIGH INTENSITY ULTRAVIOLET LIGHT.
- \* It must also be handled to avoid contact with HOT METALS. Poisonous gases such as PHOSGENE, and HYDROGEN CHLORIDE are formed.
- \* Prevent contact of Trichloroethylene with STRONG ALKALIS, such as SODIUM HYDROXIDE or POTASSIUM HYDROXIDE, because a highly flammable, toxic liquid is produced. Also prevent contact with ALUMINUM in the presence of DILUTE HYDROCHLORIC ACID, because a violent reaction will occur.
- \* Prevent contact with CHEMICALLY ACTIVE METALS, POWDERS, or SHAVINGS, such as BARIUM, LITHIUM, SODIUM, or MAGNESIUM; and TITANIUM POWDERS or SHAVINGS, since an explosion can occur.

#### QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of child-bearing age are at high risk.

Q: Should I be concerned if a chemical is a teratogen in animals?

A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

## DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

ACG is the Carcinogens Assessment Group of the federal EPA.

A carcinogen is a substance that causes cancer.

The CAS number is assigned by the Chemical Abstracts Service to identify a specific chemical.

A combustible substance is a solid, liquid or gas that will burn.

A corrosive substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A fetus is an unborn human or animal.

A flammable substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The flash point is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A miscible substance is a liquid or gas that will evenly dissolve in another.

mg/m<sup>3</sup> means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A mutagen is a substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A reactive substance is a solid, liquid or gas that can cause an explosion under certain conditions or on contact with other specific substances.

A teratogen is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The vapor pressure is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

# EMERGENCY INFORMATION

Chemical Name: TRICHLOROETHYLENE

## WARNING

Number: UN 1710

Flammability: 1

Reactivity: 0

POISONOUS GASES ARE PRODUCED IN A FIRE  
CONTAINERS MAY EXPLODE IN FIRE  
Health hazards on front page

### HAZARDS

POISONOUS GASES ARE PRODUCED IN FIRE,  
including Phosgene and Hydrogen Chloride.

CONTAINERS MAY EXPLODE IN FIRE.

Use dry chemical or CO<sub>2</sub> extinguishers.

Water can be used to keep fire-exposed  
containers cool. Water spray can also  
be used to flush spills away from exposure  
sources.

Employees are expected to fight  
fires, they must be trained and  
equipped as stated in OSHA 1910.156.

### SPILLS AND EMERGENCIES

If trichloroethylene is spilled or leaked,  
take the following steps:

Restrict persons not wearing protective  
equipment from area of spill or leak  
until clean-up is complete.

Remove all ignition sources.

Ventilate the area of spill or leak.

Absorb liquids in vermiculite, dry  
sand, earth, or a similar material and  
deposit in sealed containers.

It may be necessary to contain and dispose  
of Trichloroethylene as a HAZARDOUS  
WASTE. Contact the NJ Department of  
Environmental Protection (DEP) or  
your regional office of the federal Environmental  
Protection Agency (EPA) for  
specific recommendations.

**LARGE SPILLS AND FIRES** immediately  
notify your local fire department. You can  
request emergency information from  
the following:

**HOTLINE:** (609) 292-7172

**TREC:** (800) 424-9300

### HANDLING AND STORAGE (See page 4)

### FIRST AID

NJ POISON INFORMATION 1-800-962-1253

#### Eye Contact

- \* Immediately flush with large amounts of  
water for at least 15 minutes, occa-  
sionally lifting upper and lower lids.  
Seek medical attention immediately.

#### Skin Contact

- \* Quickly remove contaminated clothing.  
Immediately wash area with large  
amounts of soap and water. Seek med-  
ical attention immediately.

#### Breathing

- \* Remove the person from exposure.
- \* Begin rescue breathing if breathing has  
stopped and CPR if heart action has  
stopped.
- \* Transfer promptly to a medical facil-  
ity.
- \* Medical observation is recommended for  
24 to 48 hours after breathing overex-  
posure, as pulmonary edema may be de-  
layed.

### PHYSICAL DATA

Vapor Pressure: 58 mm Hg at 68°F

Water Solubility: Slightly soluble

### OTHER COMMONLY USED NAMES

Chemical Name: Trichloroethene

Other Names: 1,1,2-Trichloroethylene; Tri-  
cene; Tri; TCE

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Not intended to be copied and sold for commercial purposes.

New Jersey Department of Health  
CN 368 Trenton, NJ 08625

Date prepared: March 1986

Revision:

OES-16



New Jersey Department of Health

# HAZARDOUS SUBSTANCE FACT SHEET

**COMMON NAME:** 1,2-DICHLOROETHYLENE

**CAS NUMBER:** 540-59-0

**DOT NUMBER:** UN 1150

## HAZARD SUMMARY

- \* 1,2-Dichloroethylene can affect you when breathed in.
- \* Exposure to high concentrations of the vapor can cause you to become dizzy and lightheaded and to pass out.
- \* Long-term exposure may damage the liver.
- \* Contact can irritate the skin and eyes. The vapor may irritate the nose, throat and lungs.
- \* 1,2-Dichloroethylene is a **FLAMMABLE** and **REACTIVE CHEMICAL** and is a **FIRE** and **EXPLOSION HAZARD**.

## IDENTIFICATION

1,2-Dichloroethylene is a colorless liquid with an ether-like odor. It is used as a solvent for organic materials.

## REASON FOR CITATION

- \* 1,2-Dichloroethylene is on the Workplace Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NFPA, DOT and other authorities.
- \* This chemical is on the Special Health Hazard Substance List because it is **FLAMMABLE** and **REACTIVE**.
- \* Definitions are provided on page 5.

## WORKPLACE EXPOSURE LIMITS

**OSHA:** The legal airborne permissible exposure limit (PEL) is 200 ppm averaged over an 8-hour workshift.

**ACGIH:** The recommended airborne exposure limit is 200 ppm averaged over an 8-hour workshift and 250 ppm as a STEL (short-term exposure limit).

## HOW TO DETERMINE IF YOU ARE BEING EXPOSED

- \* Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer. If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- \* **ODOR THRESHOLD** = 17 ppm.
- \* The odor threshold only serves as a warning of exposure. Not smelling it does not mean you are not being exposed.

## WAYS OF REDUCING EXPOSURE

- \* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- \* Wear protective work clothing.
- \* Wash thoroughly immediately after exposure to 1,2-Dichloroethylene.
- \* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of 1,2-Dichloroethylene to potentially exposed workers.

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This Fact Sheet is a summary source of information for workers, employers and community residents. Health professionals also find it useful. If this substance is part of a mixture, this Fact Sheet should be used along with the manufacturer-supplied Material Safety Data Sheet (MSDS).

## HEALTH HAZARD INFORMATION

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to 1,2-Dichloroethylene:

The liquid may irritate the skin, causing a rash or burning feeling on contact, and can irritate the eyes. The vapor can irritate the nose and throat. Exposure to high concentrations of the vapor can cause you to become dizzy, lightheaded and to pass out.

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to 1,2-Dichloroethylene and can last months or years:

### Cancer Hazard

According to the information presently available to the New Jersey Department of Health, 1,2-Dichloroethylene has not been tested for its ability to cause cancer in animals.

### Reproductive Hazard

According to the information presently available to the New Jersey Department of Health, 1,2-Dichloroethylene has not been tested for its ability to adversely affect reproduction.

### Other Long-Term Effects

Repeated exposure may damage the liver and kidneys.

1,2-Dichloroethylene may damage the lungs and cause bronchitis.

Repeated exposure may cause a low blood cell count.

## MEDICAL

### Medical Testing

Those with frequent or potentially high exposure (half the TLV or greater),

the following are recommended before beginning work and at regular times after that:

- \* Lung function tests.

If symptoms develop or overexposure is suspected, the following may be useful:

- \* Liver and kidney function tests.
- \* Complete blood count.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

### Mixed Exposures

Because smoking can cause heart disease, as well as lung cancer, emphysema and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

## WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

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Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

- \* Workers whose clothing has been contaminated by 1,2-Dichloroethylene should change into clean clothing promptly.
- \* Do not take contaminated work clothes home. Family members could be exposed.
- \* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to 1,2-Dichloroethylene.
- \* Wash any areas of the body that may have contacted 1,2-Dichloroethylene at the end of each workday, whether or not known skin contact has occurred.
- \* Do not eat, smoke, or drink where 1,2-Dichloroethylene is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

#### PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

#### Clothing

- \* Avoid skin contact with 1,2-Dichloroethylene. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- \* All protective clothing suits, gloves, footwear, headgear should be clean, available each day and put on before work.

#### Eye Protection

- \* Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

#### Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- \* Where the potential exists for exposures over 200 ppm, use a MSHA/NIOSH approved full facepiece respirator with an organic vapor cartridge/canister. Increased protection is obtained from full facepiece powered air purifying respirators.
- \* If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect 1,2-Dichloroethylene, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
- \* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters, cartridges, or canisters to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- \* Exposure to 4000 ppm is immediately dangerous to life and health. If the possibility of exposures above 4000 ppm exists, use an MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

#### HANDLING AND STORAGE

- \* Prior to working with 1,2-Dichloroethylene you should be trained on its proper handling and storage.
- \* 1,2-Dichloroethylene must be stored to avoid contact with STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE) since violent reactions occur.
- \* Store in tightly closed containers in a cool, well-ventilated area away from HEAT.
- \* Sources of ignition, such as smoking and open flames, are prohibited where



1,2-Dichloroethylene is used, handled, or stored.

Metal containers involving the transfer of 5 gallons or more of 1,2-Dichloroethylene should be grounded and bonded. Drums must be equipped with self-closing valves, pressure vacuum bungs and flame arresters.

Use only non-sparking tools and equipment, especially when opening and closing containers of 1,2-Dichloroethylene.

Wherever 1,2-Dichloroethylene is used, handled, manufactured, or stored, use explosion-proof electrical equipment and fittings.

those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

#### QUESTIONS AND ANSWERS

If I have acute health effects, will I later get chronic health effects?

Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Can I get long-term effects without ever having short-term effects?

Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

What are my chances of getting sick when I have been exposed to chemicals?

The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

When are higher exposures more likely?

Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Is the risk of getting sick higher for workers than for community residents?

Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than

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The New Jersey State Department of Health, Occupational Disease Prevention and Information Program offers multiple services in occupational health. These include: Right to Know Information Resources, Public Presentations, General References, Industrial Hygiene Information, Surveys and Investigations and Medical Evaluation. Consult another Fact Sheet for a more detailed description of these services or call (609) 984-1863.

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## DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

CAG is the Carcinogens Assessment Group of the federal EPA.

A carcinogen is a substance that causes cancer.

The CAS number is assigned by the Chemical Abstracts Service to identify a specific chemical.

A combustible substance is a solid, liquid or gas that will burn.

A corrosive substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A fetus is an unborn human or animal.

A flammable substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The flash point is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A miscible substance is a liquid or gas that will evenly dissolve in another.

mg/m<sup>3</sup> means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A mutagen is a substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A reactive substance is a solid, liquid or gas that can cause an explosion under certain conditions or on contact with other specific substances.

A teratogen is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The vapor pressure is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

## EMERGENCY INFORMATION

Common Name: 1,2-DICHLOROETHYLENE

DOT Number: UN 1150  
NFPA Flammability: 3  
NFPA Reactivity: 2

### WARNING

FLAMMABLE AND REACTIVE LIQUID  
POISONOUS GAS PRODUCED IN FIRE  
CONTAINERS MAY EXPLODE IN FIRE  
Health hazards on front page

### FIRE HAZARDS

- \* 1,2-Dichloroethylene is a FLAMMABLE LIQUID.
- \* Use dry chemical, CO<sub>2</sub>, water spray, or foam extinguishers.
- \* POISONOUS GAS IS PRODUCED IN FIRE.
- \* CONTAINERS MAY EXPLODE IN FIRE.
- \* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

### SPILLS AND EMERGENCIES

If 1,2-Dichloroethylene is spilled or leaked, take the following steps:

- \* Restrict persons not wearing protective equipment from areas of spills or leaks until clean-up is complete.
- \* Remove all ignition sources.
- \* Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
- \* Keep 1,2-Dichloroethylene out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
- \* It may be necessary to contain and dispose of 1,2-Dichloroethylene as a HAZARDOUS WASTE. Contact the NJ Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your local fire department. You can also request emergency information from the following:

DEP HOTLINE: (609) 292-7172  
CHEMTREC: (800) 424-9300

### HANDLING AND STORAGE (See page 3)

### FIRST AID

#### NJ POISON INFORMATION 1-800-962-1253

#### Eye Contact

- \* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention.

#### Skin Contact

- \* Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water.

#### Breathing

- \* Remove the person from exposure.
- \* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- \* Transfer promptly to a medical facility.

### PHYSICAL DATA

Vapor Pressure: 180-265 mm Hg at 68°F  
Flash Point: 36-39°F  
Water Solubility: Slightly soluble

### OTHER COMMONLY USED NAMES

Chemical Name: Ethene, 1,2-Dichloro-  
Other Names: Acetylene Dichloride; trans-Dichloroethylene; sym-Dichloroethylene

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Not intended to be copied and sold for commercial purposes.

**ATTACHMENT 2**

**HEAT EXHAUSTION/STROKE INFORMATION SHEETS**

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## 1. Heatstroke

The classical description of heatstroke includes: (1) a major disruption of central nervous function (unconsciousness or convulsions); (2) a lack of sweating; and (3) a rectal temperature in excess of 41°C (105.8°F) [4,59,75,76]. The 41°C rectal temperature is an arbitrary value for hyperpyrexia, because the disorder has not been produced experimentally in humans so that observations are made only after the admission of patients to hospitals, which may vary in time from about 30 minutes to several hours after the event. In some heatstroke cases, sweating may be present [76]. The local circumstances of metabolic and environmental heat loads which give rise to the disorder are highly variable and are often difficult or impossible to reconstruct with accuracy. The period between the occurrence of the event and admission to a hospital may result in a quite different medical outcome from one patient to another depending on the knowledge, understanding, skill, and facilities available to those who render first aid in the intervening period. Recently, the sequence of biologic events in some fatal heatstroke cases have been described [77].

Heatstroke is a MEDICAL EMERGENCY, and any procedure from the moment of onset which will cool the patient improves the prognosis. Placing the patient in a shady area, removing outer clothing and wetting the skin, and increasing air movement to enhance evaporative cooling are all urgently needed until professional methods of cooling and assessment of the degree of the disorder are available. Frequently, by the time a patient is admitted to a hospital, the disorder has progressed to a multisystem lesion affecting virtually all tissues and organs [77]. In the typical clinical presentation, the central nervous system is disorganized, and there is commonly evidence of fragility of small blood vessels, possibly coupled with the loss of integrity of cellular membranes in many tissues. The blood-clotting mechanism is often severely disturbed, as are liver and kidney functions. It is not clear, however, whether these events are present at the onset of the disorder, or whether their development requires a combination of a given degree of elevated body temperature and a certain period for tissue or cellular damage to occur. Postmortem evaluation indicates there are few tissues which escape pathological involvement. Early recognition of the disorder or its impending onset, associated with appropriate treatment, considerably reduces the death rate and the extent of organ and tissue involvement. An ill worker should not be sent home or left unattended without a physician's specific order.

## 2. Heat Exhaustion

Heat exhaustion is a mild form of heat disorder which readily yields to prompt treatment. This disorder has been encountered frequently in experimental assessment of heat tolerance. Characteristically, it is sometimes but not always accompanied by a small increase in body temperature (38°-39°C or 100.4°-102.2°F). The symptoms of headache, nausea, vertigo, weakness, thirst, and giddiness are common to both heat exhaustion and the early stage of heatstroke. There is a wide interindividual variation in the ability to tolerate an increased body

temperature; some individuals cannot tolerate rectal temperatures of 38°-39°C, and others continue to perform well at even higher rectal temperatures [78].

There are, of course, many variants in the development of heat disorders. Failure to replace water may predispose the individual to one or more of the heat disorders and may complicate an already complex situation. Therefore, cases of hyperpyrexia can be precipitated by hypohydration. It is unlikely that there is only one cause of hyperpyrexia without some influence from another. Recent data suggest that cases of heat exhaustion can be expected to occur some 10 times more frequently than cases of heatstroke [59].

### 3. Heat Cramps

Heat cramps are not uncommon in individuals who work hard in the heat. They are attributable to a continued loss of salt in the sweat, accompanied by copious intake of water without appropriate replacement of salt. Other electrolytes such as  $Mg^{++}$ ,  $Ca^{++}$ , and  $K^{+}$  may also be involved. Cramps often occur in the muscles principally used during work and can be readily alleviated by rest, the ingestion of water, and the correction of any body fluid electrolyte imbalance.

### 4. Heat Rashes

The most common heat rash is prickly heat (miliaria rubra), which appears as red papules, usually in areas where the clothing is restrictive, and gives rise to a prickling sensation, particularly as sweating increases. It occurs in skin that is persistently wetted by unevaporated sweat, apparently because the keratinous layers of the skin absorb water, swell, and mechanically obstruct the sweat ducts [21,79,80]. The papules may become infected unless they are treated.

Another skin disorder (miliaria crystallina) appears with the onset of sweating in skin previously injured at the surface, commonly in sunburned areas. The damage prevents the escape of sweat with the formation of small to large watery vesicles which rapidly subside once sweating stops, and the problem ceases to exist once the damaged skin is sloughed.

Miliaria profunda occurs when the blockage of sweat ducts is below the skin surface. This rash also occurs following sunburn injury, but has been reported to occur without clear evidence of previous skin injury. Discrete and pale elevations of the skin, resembling gooseflesh, are present.

In most cases, the rashes disappear when the individuals are returned to cool environments. It seems likely that none of the rashes occur (or if they do, certainly with greatly diminished frequency) when a substantial part of the day is spent in cool and/or dry areas so that the skin surface can dry.

Although these heat rashes are not dangerous in themselves, each of them carries the possibility of resulting patchy areas which are anhidrotic, and thereby adversely affects evaporative heat loss and thermoregulation. In experimentally induced miliaria rubra, sweating capacity recovers within 3-4 weeks [79,80]. Wet and/or damaged skin could absorb toxic chemicals more readily than dry unbroken skin.

### C. Chronic Heat Disorders

Some long term effects from exposure to heat stress (based on anecdotal, historical, and some epidemiologic and experimental evidence) have been suggested. Recently, the evidence was reviewed by Dukes-Dobos who proposed a three-category classification of possible heat-related chronic health effects [77]. The three categories are Type I - those related to acute heat illnesses such as reduced heat tolerance following heatstroke or reduced sweating capacity; Type II - not clear clinical entities, but are similar to general stress reactions; and Type III - which includes anhidrotic heat exhaustion, tropical neurosthenia, and increased incidence of kidney stones. The primary references cited in the review are suggestive of some possible chronic heat effects. However, the available data do not contribute information of value in protecting workers from heat effects. Nevertheless, the concept of chronic health effects from heat exposure may merit further formal laboratory and hot industry investigations.

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**ATTACHMENT 3**

**EQUIPMENT DECONTAMINATION PROCEDURES**

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## **EQUIPMENT DECONTAMINATION PROCEDURES**

### **A. NON-AQUEOUS SAMPLING EQUIPMENT**

1. Detergent and tap water - scrub to remove visual contamination.
2. Generous tap water rinse.
3. Distilled and deionized water rinse.

Note: If visual contamination persists or gross contamination is suspected, an acetone rinse step will be included when analyzing for organic constituents, and a nitric acid rinse step will be included when analyzing for inorganic constituents.

### **B. AQUEOUS SAMPLING EQUIPMENT**

1. Detergent and tap water wash.
2. Generous tap water rinse.
3. Distilled and deionized water rinse.
4. 10% nitric acid rinse<sup>1</sup>.
5. Distilled and deionized water rinse<sup>1</sup>.
6. Acetone rinse<sup>2</sup>.
7. Total air dry or nitrogen blow out<sup>2</sup>.
8. Distilled and deionized water rinse<sup>2</sup>.

<sup>1</sup> - Only if sample is to be analyzed for metals.

<sup>2</sup> - Only if sample is to be analyzed for organics.



**ATTACHMENT 4**

**PID CALIBRATION AND MAINTENANCE LOG**

300780



PID/FID CALIBRATION AND MAINTENANCE LOG

INSTRUMENT MANUFACTURER/MODEL \_\_\_\_\_  
 IDENTIFICATION NO.: \_\_\_\_\_  
 LAMP (Circle One) 9.5eV 10.2eV 11.7eV

DATE/ TIME	INITIALS	BATTERY CHECK	CALIBRATION STANDARD			SPAN POT. SETTING	COMMENTS
			SOURCE	TYPE	CONC.		